Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1. (original)   A method of constructing a virtual three-dimensional model of an object from a scanner, a data processing system, and at least one machine-readable memory accessible to said data processing system, comprising the steps of:

(a)   scanning the object with the scanner and thereby obtaining at least two two-dimensional images of the object, wherein during scanning the scanner and object are moved relative to each other resulting in each image being taken from a different position relative to the surface of the object;

(b)   processing said data representing said set of images with said data processing system so as to convert each of said two-dimensional images into a data representing a frame and thereby generate a set of frames corresponding to said images, said set of frames comprising a cloud of individual points, each point in each frame expressed as a location in a three-dimensional coordinate system;

(c)   storing data representing said set of frames in said memory; and

(d)   further processing said data representing said set of frames with said data processing system so as to register said frames relative to each other to thereby produce a three-dimensional virtual model of the object substantially consistent with all of said frames.

Claim 2. (original)   The method of claim 1, wherein step (d) comprises the step of performing a frame to frame registration of said set of frames, wherein each frame is registered with respect to one other frame in said set of frames.

Claim 3. (original)   The method of claim 1, wherein step (d) comprises the step of performing a cumulative registration of said set of frames, wherein at least some of said frames are registered to a plurality of other frames previously having been registered to other frames in said set of frames.

Claim 4. (original)   The method of claim 1, wherein step (d) comprises performing a frame to frame registration of said set of frames, wherein each frame is registered with respect to one other frame in said set of frames, and thereafter performing a cumulative registration of said frames wherein at least some of said frames are registered to a plurality of other frames previously having been registered to other frames in said set of frames.

Claim 5. (original)   The method of claim 1, wherein in step (d) one of said frames is a starting frame for registration, and wherein a spatial transformation relationship is derived for each of the other frames in said set of frames and stored in said memory, said spatial transformation relationship indicating how the points in said frame should be translated and rotated in a three-dimensional coordinate system to register said frames relative to said starting frame.

Claim 6. (original)   The method of claim 5, wherein said starting frame corresponds to the first image captured by said scanner.

Claim 7. (original)   The method of claim 5, wherein said starting frame corresponds to selected image taken of the object and in which other images were taken of the object in the same vicinity of the object such that a substantial amount of overlap exists between said selected image and said other images.

Claim 8. (original)   The method of claim 1, wherein, in step (d), said set of frames are registered to each other in a sequential order with the order determined, at least in part, upon the degree of overlap in coverage of said object in said frames.

Claim 9. (original)   The method of claim 1, wherein said scanner comprises a hand-held scanning device and said object is scanned by moving said hand-held scanning device over said object.

Claim 10. (original)   The method of claim 9, wherein said object comprises a human.

Claim 11. (original)   the method of claim 10, wherein said object comprises teeth and associated anatomical structures.

Page 4 of 14

Claim 12. (original)   The method of claim 9, wherein said object comprises a model of an anatomical structure of a human.

Claim 13. (original)   The method of claim 1, wherein said data processing system is incorporated into a work station for said scanner.

Claim 14. (original)   The method of claim 1, wherein said data processing system comprises a general purpose computer operatively connected to said scanner and said memory.

Claim 15. (original)   The method of claim 1, wherein said data processing system comprises at least two independent processors sharing the processing required by steps (c) and (d).

Claim 16. (original)   The method of claim 15, wherein one of said processors is incorporated into a work station for said scanner and wherein the other processors comprises a computer remote from said work station.

Claim 17. (original)   The method of claim 16, wherein said object comprises teeth and associated anatomical structures, and wherein said work station and scanner are located in an orthodontic clinic, and wherein said computer remote from said work station comprises a computer in said orthodontic clinic.

Claim 18. (original)   The method of claim 1, wherein said scanner, said memory and said data processing system are housed in a single unit.

Claim 19. (original)   The method of claim 1, wherein said data processing system is coupled to a user interface including a display, and wherein data processing system is operative to display said virtual three dimensional model on said display.

Claim 20. (original)   An orthodontic scanning system performing the method of any of claims 1-19.

32. Claim 21-32. (canceled)

Claim 33. (original)   A method of creating a virtual three-dimensional object, comprising the steps of:

    a)   scanning said object in a series of scans, each scan generating a set of images;

    b)   converting said set of images into a set of three-dimensional frames;

    c)   registering said frames in each of said series of scans to each other to thereby generate a series of segments, each segment comprising a portion of a three-dimensional model of the object; and

    d)   registering said segments relative to each other to thereby create said virtual three-dimensional model.

Claim 34. (original)   The method of claim 33, wherein step d) comprises the steps of:

1. displaying on a monitor each of said segments,

2. prompting a user to select with a user interface device a location on each of said segments which overlaps at least one other segment;

3. storing said locations selected by said user; and

4. using said stored locations as a starting point for registering said segments relative to each other.

Claim 35. (original)   The method of claim 34, further comprising the step of displaying on said monitor the virtual three-dimensional model.

Claim 36. (original)   The method of claim 33, further comprising the step of performing a cumulative registration of all of said frames forming said virtual three-dimensional model.

Claim 37. (original)   The method of claim 34, wherein said object comprises teeth and wherein said locations selected by the user in step 2. comprise locations where virtual brackets are placed on teeth in an orthodontic treatment planning for said teeth.

Claim 38. (original)   The method of claim 37, wherein said locations are represented on said display by a graphical icon.

Claim 39. (original) The method of claim 38, wherein said icon appears as a virtual three-dimensional object.

Claim 40. (original)The method of claim 39, wherein said virtual three-dimensional object comprises a circular portion having a center located on the location selected by the user and direction indicating portion.

Claim 41. (original) An orthodontic workstation performing steps b, c) and d) of the method of claim 33.

Claim 42. (original) The method of claim 33, wherein said step of scanning is performed with a hand-held scanner.

Claim 43. (original) A method of constructing a virtual three-dimensional model of an object using a data processing system, and at least one machine-readable memory accessible to said data processing system, comprising the steps of:

(a) obtaining a set of at least two digital three-dimensional frames of portions of the object, wherein said at least two frames comprise a set of point coordinates in a three dimensional coordinate system providing differing information of the surface of said object, whereas those frames provide a substantial overlap of the represented portions of the surface of the said object;

(b) storing data representing said set of frames in said memory; and

OraMetrix, Inc.
2350 Campbell Creek Blvd., Suite 400
Richardson, Texas 75082

Page 8 of 14

(c)   processing said data representing said set of frames with said data processing system so as to register said frames relative to each other to thereby produce a three-dimensional virtual representation of the portion of the surface of said object covered by said set of frames, without using pre-knowledge about the spatial relationship between said frames; said three-dimensional virtual representation being substantially consistent with all of said frames.

Claim 44. (original)   The method of claim 43, wherein said at least two digital three-dimensional frames are obtained from a CT scanner.

Claim 45. (original)   The method of claim 43, wherein said at least two digital three-dimensional frames are obtained from a Magnetic Resonance Tomography (MRT) scanner.

Claim 46. (original)   The method of claim 43, wherein said at least two digital three-dimensional frames are obtained from a processing of a at least two overlapping two-dimensional images containing three-dimensional information.

Claim 47. (original)   The method of claim 43, wherein step (c) comprises the step of performing a frame to frame registration of said set of frames, wherein each frame is registered with respect to one other frame in said set of frames.

Claim 48. (original)   The method of claim 43, wherein step (c) comprises the step of performing a cumulative registration of said set of frames, wherein at least some of said frames are registered to a plurality of other frames previously having been registered to other frames in said set of frames.

Claim 49. (original)   The method of claim 43, wherein step (c) comprises performing a frame to frame registration of said set of frames, wherein each frame is registered with respect to one other frame in said set of frames, and thereafter performing a cumulative registration of said frames wherein at least some of said frames are registered to a plurality of other frames previously having been registered to other frames in said set of frames.

Claim 50. (original)   The method of claim 43, wherein in step (c) one of said frames is a starting frame for registration, and wherein a spatial transformation relationship is derived for each of the other frames in said set of frames and stored in said memory, said spatial transformation relationship indicating how the points in said frame should be translated and rotated in a three-dimensional coordinate system to register said frames relative to said starting frame.

Claim 51. (original)   The method of claim 50, wherein said starting frame corresponds to a first frame obtained of the object.

Claim 52. (original)   The method of claim 50, wherein said frames are derived from two-dimensional images of said object, and wherein said starting frame corresponds to a selected image taken of the object and in which other images were taken of the object in the same vicinity of the object such that a substantial amount of overlap exists between said selected image and said other images.

Claim 53. (original)   The method of claim 43, wherein, in step c) said set of frames are registered to each other in a sequential order with the order determined, at least in part, upon the degree of overlap in coverage of said object in said frames.

Claim 54. (original)   The method of claim 43, said set of frames are obtained from a scanning system having a scanner and wherein said scanner comprises a hand-held scanning device and said object is scanned by moving said hand-held scanning device over said object.

Claim 55. (original)   The method of claim 43, wherein said object comprises a human.

Claim 56. (original)   The method of claim 55, wherein said object comprises teeth and associated anatomical structures.

Claim 57. (original)   The method of claim 56, wherein said object comprises a model of an anatomical structure of a human.

Claim 58. (original) The method of claim 43, wherein said data processing system is incorporated into a work station for a scanner.

Claim 59. (original) The method of claim 43, wherein said data processing system comprises a general purpose computer operatively connected to a scanner and said memory.

Claim 60. (original) The method of claim 43, wherein said data processing system is coupled to a user interface including a display, and wherein data processing system is operative to display said virtual three dimensional model on said display.

OraMetrix, Inc.   Page 12 of 14
2350 Campbell Creek Blvd., Suite 400
Richardson, Texas 75082